

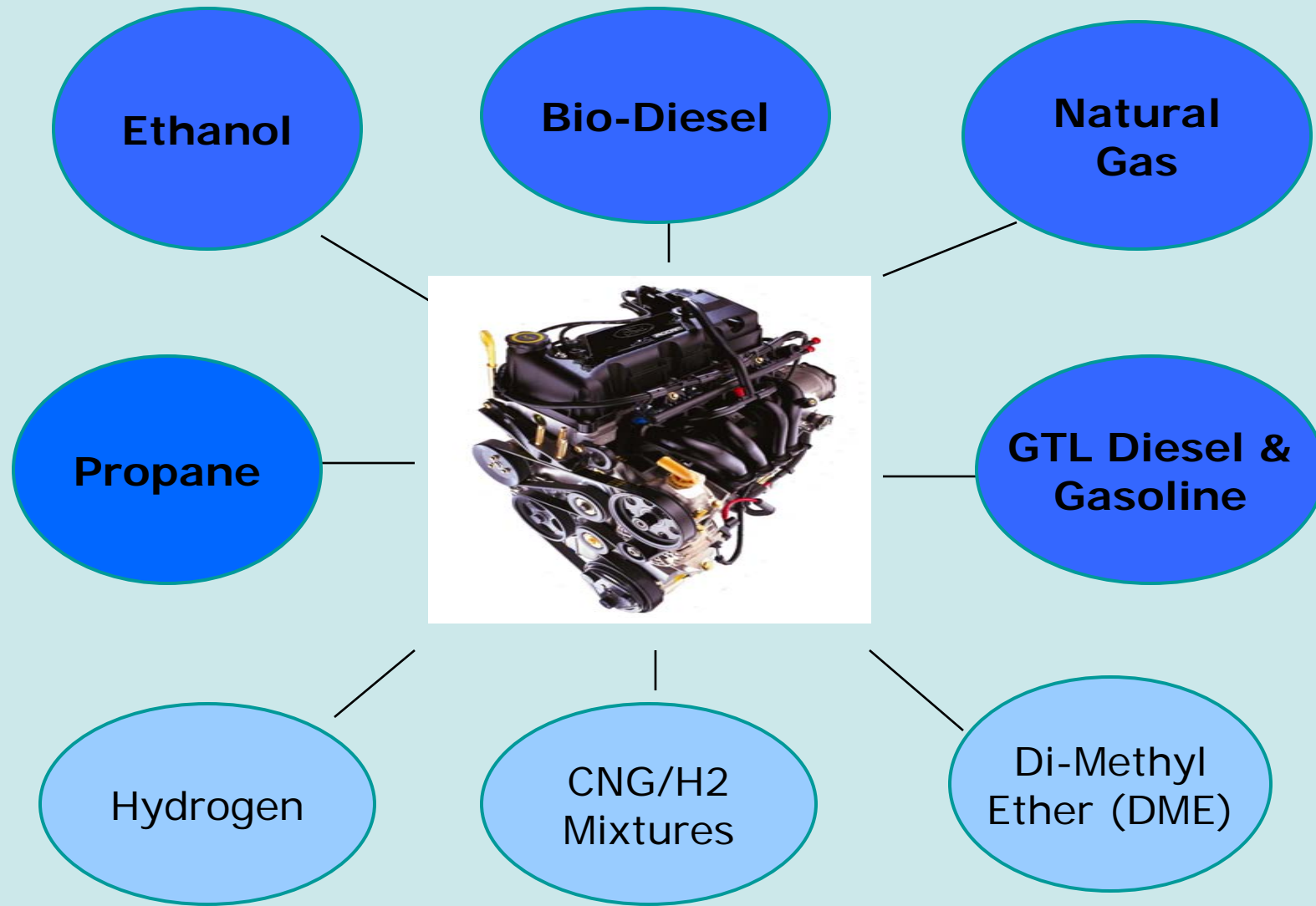
CEC Workshop on Air Quality and Opportunities to Expand the Use of Alternative Transportation Fuels

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Alternative Transportation Fuel Supply Options for California



“5E” LCA Models* Should be Utilized for Assessing Alternative Transportation Fuel Options for California

1. Economic (E1) Viability
2. High Energy (E2) Efficiency
3. Least Impact on the Environment (E3)
4. Evaluation (E4) of the Current and Emerging Technologies
5. Most Effective (E5) Solution

*“5E” Models developed and supported by TSS Consultants using engineering and scientific data generated by REI International, Desert Research Institute, C-CERT and others.

“5E” LCA Models

- Economic Viability (E1) = (Benefits) – (Costs)
= (B1+ B2 + Bn) – (C1 + C2 + Cn)
- Energy Efficiency (E2) = $\frac{(\text{Sum Energy Outputs}) * (100)}{(\text{Sum Energy Inputs})}$
- Environmental Impacts (E3):
 1. Criteria Air Pollutants
 2. Hazardous Air Pollutants
 3. Green-House Gas Emissions

“5E” LCA Models

➤ Evaluation (E4): Evaluate Candidate Technologies for Each of the Following Phases of Alternative Fuel Production and Utilization:

1. Research
2. Development
3. Demonstration
4. Deployment

➤ Effectiveness (E5): Socio-Political Factors

1. Government Regulations
2. Organizational Objectives
3. Environmental Stewardship
4. Stakeholder Requirements

Alternative Fuels in California

Discussion and Recommendations (D&R)

Ethanol

- The sole production of ethanol from starch is not recommended for the long-term as based upon “5E” assessments
- Future efforts should also concentrate on the production of ethanol from waste biomass materials, in particular agricultural waste (e.g. corn Stover).

Alternative Fuels in California (D&R)

Bio-diesel

Bio-diesel is an acceptable substitute for diesel fuel:

- Bio-diesel will continue to represent a “niche” volume market.
- Diesel engine emissions are reduced.
- Fuel quality specifications need to be adopted and enforced
- “5E” Assessments should be carried out to obtain a better understanding of the advantages and disadvantages of bio-diesel.

Alternative Fuels in California (D&R)

GTL Diesel Fuels

- GTL conversion processes produce a high-quality diesel fuel with no sulfur and high-cetane
- GTL diesel fuels can be produced from waste biomass materials and abundant fossil fuels (e.g. coal) with high-energy efficiency and minimal impact on the environment
- Fuel thermal efficiency improvements as high as 43% can be achieved, compared to gasoline engines
- Diesel emissions are significantly reduced, with the prospect that the new California diesel emission standards can be meet

Alternative Fuels in California (D&R)

GTL Diesel Fuels

- California should significantly increase its support of programs that will lead to the introduction of GTL diesel fuels and other renewable fuels.
- “5E” Assessments should be carried out to obtain a better understanding of the advantages and disadvantages of using GTL diesel.
- Further studies are needed to measure emissions from current and emerging diesel engine technologies using GTL diesel.

Alternative Fuels in California (D&R)

Propane

- The use of propane as a vehicle fuel is not recommended as based upon preliminary “E5” assessments.
- Instead, we recommend that dimethyl-ether be seriously considered as a clean, energy efficient fuel that can utilize the existing LPG infrastructure.

Alternative Fuels in California (D&R)

Plug-In Hybrid Electric Vehicles

- This technology will not offer a bridge in accelerating market penetration for future zero-emission vehicles
- California should develop policies that greatly accelerate the introduction of hybrid-electric vehicles.
- Small, electric vehicles (e.g. neighborhood vehicles) should still be considered as viable options.

Alternative Fuels in California (D&R)

Fuel Formulation and Vehicle Emission Standards

- The new CA vehicle emission standards for criteria and toxic emissions are sufficient to protect human health and welfare for the long-term
- CA should increase its support for:
 - the production of high-efficiency fuels and associated vehicle technologies that will result in a substantial increase in fuel economy
 - the production of renewable fuels from waste materials